Art, Pain & Cannabinoids

• Bill Griesar, Ph.D.
  – Neuroscience, WSU Vancouver
  – Psychology, Portland State University
  – Behavioral Neuroscience, OHSU
  – NW Noggin

• Jeff Leake, M.F.A.
  – Neuroscience, WSU Vancouver
  – NW Noggin

• Ram Kandasamy
  – Neuroscience, WSU Vancouver
  – NW Noggin

• Cole Taylor Dawson
  – Neuroscience, WSU Vancouver
  – NW Noggin
Past Month Illicit Drug Use among Persons 12 or Older: 2014

- **Illicit Drugs**: 24.6
- **Marijuana**: 22.2
- **Psychotherapeutics**: 6.5
- **Cocaine**: 1.5
- **Hallucinogens**: 1.3
- **Inhalants**: 0.5
- **Heroin**: 0.3

18.9 million in 2015!!

The most popular “illicit” drug

**SOURCE:** Substance Abuse and Mental Health Services Administration, Health & Human Services (2015)

http://www.samhsa.gov/data/sites/default/files/NSDUHresultsPDFWHTML2013/Web/NSDUHresults2013.htm
In 2015, **119.0 million Americans** aged 12 or older used prescription psychotherapeutic drugs in the past year, representing **44.5 percent** of the population. (SAMHSA)
Marijuana use in the past month among youths aged 12 to 17, by state: percentages, annual averages, 2013-2014; SAMHSA NSDUH
Perceptions of great risk of harm from smoking marijuana once a month among youths aged 12 to 17, by state: percentages, annual averages, 2013-2014; SAMHSA NSDUH

[Map showing the perception of risk by state with color coding for different percentage ranges.]
• Harry Anslinger, first Commissioner of Narcotics, Bureau of Narcotics

• “Those who are habitually accustomed to use of the drug are said to develop a delirious rage after its administration, during which they are temporarily, at least, irresponsible and liable to commit violent crimes.”

A history of demonization
Marijuana is still a Schedule I substance
DEA Rejects Attempt To Loosen Federal Restrictions On Marijuana


“We had them smoke it in the lab, then studied their mood and cognition,” recalls Dr. Hutchinson*... “And what they told me was ‘that was disgusting, what are you giving me? I would never, ever smoke that stuff.’”

*http://www.colorado.edu/changelab/dr-kent-hutchison


From August 2016: more sources now permitted for research... Up until now, the DEA only certified ONE supplier, the University of Mississippi, known for shipping freeze-dried, re-hydrated samples...
Cannabis contains cannabinoids

- More than 80!
- Concentrated in resin
- *Lots of variability*, depending on strain, other factors...

SOURCE: Cannabis, a complex plant: different compounds and different effects on individuals, Atakan (2012)
Marijuana is smoked...and eaten

“I strained to remember where I was or even what I was wearing, touching my green corduroy jeans and staring at the exposed-brick wall. As my paranoia deepened, I became convinced that I had died and no one was telling me...” New York Times, 6/3/13
Cannabinoids act at cannabinoid receptors: CB1 and CB2

CB1 Receptors

*Abundant!*
- Cerebellum
- Basal ganglia
- Hippocampus
- Brainstem
- Spinal cord
- Neocortex

CNS expression in areas important for motor coordination, memory, nausea, decision making, pain...

Endogenous cannabinoid neurotransmitters

*If we have receptors for cannabinoids like THC, why are they there?* What neurotransmitters act at these endogenous receptors?

Derived from arachidonic acid, a fatty acid found in membranes

- Anandamide
- 2-AG
Anxiety: Genetic protection?

Decreased anxiety in humans and mice with FAAH C385A

Breakdown by FAAH; several Forms (A, C)

A less common; Less effective at breakdown

Cannabinoids reduce pain

A large body of literature indicates that cannabinoids suppress behavioral responses to acute and persistent noxious stimulation... (Walker JM, Hohmann AG, 2005)

Co-administration of cannabinoids and opioids allows for pain relief with a lower opioid dose! (e.g., Wilson AR, Maher L, Morgan MM, 2008)
More therapeutic effects

• Appetite stimulation
  (e.g., Foltin, 1988; Grotenhermen, 2012)
  *Why is this therapeutic?*

• Nausea relief
  (e.g., Parker et al (2011); “The anti-emetic effect of cannabinoids has been shown across a wide variety of animals that are capable of vomiting in response to a toxic challenge.” Also studies referenced by the National Cancer Institute at cancer.gov; though chronic use linked to hyperemesis syndrome; Soriano-Co M, 2010)
STILL MORE therapeutic effects

• Multiple sclerosis

• Epilepsy
  – E.g., “The case for medical marijuana in epilepsy,” Maa (2014)

• Cancer
Marijuana impairs cognition, memory, motor coordination

- Deficits in acute verbal and spatial memory (e.g., Curran et al, 2002)
- Deficits in working/short-term memory (Schoeler 2013)
- Cannabis and alcohol both impair skills critical for driving (Sewell RA et al, 2009)
- Differential effects on socialization (Atakan, 2012)
Early chronic marijuana exposure linked to decline in IQ

Regular cannabis use that starts in adolescence strips away IQ, a NIDA-supported 25-year study of 1,000 individuals suggests. Study participants who initiated weekly cannabis use before age 18 dropped IQ points in proportion to how long they persisted in using the drug, while nonusers gained a fraction of a point.

Risks of chronic adolescent use

- **Cognitive impairment**: IQ drop

- **Risk of dependence**: 9% of those who experiment; 1 in 6 of those who start using in adolescence, and 25 – 50% of those who smoke daily...

- **Changes in functional connectivity**

- **Increased risk of anxiety and depression, and schizophrenia/psychosis** in those with a preexisting genetic vulnerability (But from Volkow article: “It is inherently difficult to establish causality in these types of studies because factors other than marijuana use may be directly associated with the risk of mental illness…”)

- **School performance**: “Early marijuana use is associated with impaired school performance...although reports of shared environmental factors...suggest that the relationship may be more complex...”
However...we’re still learning

- Cannabis use is quantitatively associated with nucleus accumbens and amygdala abnormalities in young adult recreational users.

Nucleus accumbens, amygdala are part of motivational networks (what you seek, what you avoid...)

But wait - *which is it*..?

- **Daily Marijuana Use Is Not Associated with Brain Morphometric Measures in Adolescents or Adults**


Same journal
Different research group
* Controlled for alcohol exposure...
Past Month Illicit Drug Use

Youths Aged 12 to 17: 2002-2013
Substance Abuse and Mental Health Services Administration
National Survey on Drug Use and Health, 2013
Alcohol Use in the Past Month among Youths Aged 12 to 17, by State; SAMHSA NSDUH

Percentages, Annual Averages Based on 2013 and 2014 NSDUHs